

# **An Analysis of the Economic Cycles of the English Speaking Caribbean Countries**

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## **Abstract**

For decades, the problem of dating the business cycle presented a major concern for businessmen and policy makers. Despite the development of many statistical methodologies dedicated to the detection of turning points in the cycle, only a few countries compile and publish an official chronology of the economic cycle. This paper proposes a study of business cycles in the Caribbean basin by considering the cases of Barbados, Jamaica and Trinidad and Tobago, the only countries in this geographical area for which databases with sufficient high frequency are available over long periods. First, common methods are used to identify and develop a description of the main empirical features of the turning points of the business cycle and the growth cycle. Second, the focus is on comparing the phases of the cycles obtained for these three countries and to examine their synchronization with other countries.

***JEL Classification:*** C32 ; E32.

***Keywords:*** business cycle ; growth cycle; Bry-Boschan procedure; trend-cycle decomposition, synchronization cycles.

## 1. Introduction

Since October 2008, the national and international news have been largely dominated by discussions on the global economic crisis. In 2009, the great recession, as it is now called, led the Organization for Economic Co-operation and Development (OECD) to implement stimulus policies that helped to contain the devastating consequences of the economic imbalances as seen when many countries started to experience positive growth rates at the beginning of 2010. However, pessimism returned in 2011 and 2012 and these economies registered relapse rates of real output growth.

Periods of recession and recovery and the challenges and issues posed by these cycles suggest that policymakers need clear information about the depth and short-term developments of economic activity. In this regard, the identification of turning points in the economic cycle is one of the main tasks of forecasters. Early detection and even the anticipation of specific times when economic cycles are turning should alert the government to prepare its decisions and implement appropriate economic policies. Fortunately, since 2000, governments have been addressing this exercise of correctly identifying economic cycles.

A considerable number of publications has been devoted to the study of business cycles in developed countries (see among others Mazzi and Savio (2002), Harding and Pagan (2002), Bruno and Otranto (2004)) and developing economies (see for example Rand and Tarp (2002), Du Plessis and Smit (2004) and Fathi (2007)). This business cycle research began in the United States (US) under the auspices of the National Bureau for Economic Research (NBER) in 1854 and during the 2000s in Europe, following the creation of the Centre for Economic Policy Research (CEPR). The European monetary union was the first organization to highlight the need to conduct comparative analysis of cycles in member countries to check the

similarity of the mechanisms of the propagation cycles (see for example, Bentoglio, Fayolle and Lemoine (2001), Krolzig and Toro (2001), Inklaar, Jacobs and Romp (2004) and Mönch and Uhlig. (2004)).

For the Caribbean countries, the focus of this study, business cycle empirical investigation was undertaken from the 2000s. Cashin (2004) was among the first authors, and he, using an annual database, addressed the questions of the (i) existence of the causal relations between gross domestic product (GDP) and the level of cyclical fluctuations in the Caribbean nations of Antigua and Barbuda, Dominica, Grenada, St. Kitts and Nevis, Saint Lucia and Saint Vincent and the Grenadines and (ii) cycles between the Caribbean islands and the developed countries of the US, the United Kingdom (UK), Canada and Germany.

Employing the more relevant high frequency data set (quarterly) for this type of business cycle research, Craigwell and Maurin (2007a, 2007b), utilizing the case of Barbados, brought many insights to better understand economic fluctuations in small open economies like those of the Caribbean. They proposed a chronology and a statistical description of the total and sectoral business cycles for Barbados, and then conducted a comparative analysis of the Barbados and U.S. cycles. [What about Whyte \(2008\) work on Jamaica?](#)

This article is a continuation of work on the business cycles in small developing countries, considering the particular case of the English-speaking Caribbean. It is very relevant in the current environment where the community of businessmen and policy makers is very concerned about the threat and consequences of the global recession, and finds it urgent to document the facts and features related to the behavior of GDP and the main indicators of economic activity of Caribbean countries.

The goals of the paper are threefold. First, it provides an update of the previous results of Craigwell and Maurin (2007a, 2007b)) by revisiting the recent literature devoted to the methodological aspects of the identification and characterization of business cycles (see Everts (2006) and Hall and McDermott (2006, 2011)), and by adding about thirty extra quarters of GDP to evaluate the business cycle of a greater number of countries, that is, Barbados, Jamaica, Trinidad and Tobago. Second, it uses a complementary approach similar to the work of Agenor, McDermott and Prasad (2000) and Whyte (2008) by dating the three countries, and then examining their links with the cycles of the Western countries, mainly those who maintain strong ties or influence on Caribbean economies. Finally, the issue of empirical verification of the interactions between real activity and monetary and financial spheres in these three countries are investigated.

## **2. Concepts and Issues in the Identification of Cycles**

### ***2.1. Definitions and Concepts***

The analysis of business cycles has long been driven by the work of the NBER in the US.

After a period of obsolescence, economic cycles came back in the 1970s as a significant component of the functioning of market economies. Burns and Mitchell (1946, p..) defined business cycles as

“a type of fluctuation found in the aggregate economic activity of nations that organize their work mainly in business enterprises: a cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions, and revivals which merge into the expansion phase of the next cycle; in duration, business cycles vary from more than one year to ten or twelve years; they are not divisible into shorter cycles of similar characteristics with amplitudes approximating their own. A recession is a significant decline in economic activity spread across the economy, lasting more than a few months, normally visible in production, employment, real income, and other indicators. A recession begins when the economy reaches a peak of activity and ends when the economy reaches its trough. Between trough and peak, the economy is in an expansion. “

As mentioned earlier, official interest in the analysis of business cycles started in the US a long time ago, almost 70 years. However, it was only taken into account in the preparation and evaluation of government economic policy in other countries since 1990. The rise of the European Community led policymakers to develop a device for dating the business cycle in the euro area in 2003 when the CEPR in London created a committee of dating, composed of six members from several European universities. With their expertise acknowledged and to some extent their "new look" in the field of economic analysis, it is interesting to note their definition of a recession:

"A recession is a significant decline in the level of economic activity that affects the entire Euro zone. This decline is usually spotted by two consecutive quarters of negative GDP growth, employment and other indicators of aggregate economic activity and reflects similar developments in most countries of the area. A recession begins just after a peak of economic activity has been reached and ends in a cyclical trough, when the activity reached its lowest level. Between the trough and peak, the economy is said to be expanding; between peak and trough, it is in recession. "ref

Note whether a recession is based on the older and newer NBER definition, from Europe or that derived elsewhere it is clear, as Ferrara (2009) reminded us, economic cycles were not dead. In fact, past cycles can have different characteristics from those of today especially their duration, amplitude and asymmetries. However it remains true that they occur in all countries by sequencing alternating phases of recurrent expansion and contraction of a large number of economic and financial variables.

## ***2.2. The Typology of Economic Cycles***

From a purely practical standpoint, it appears that there exist some difficulties to move from the theoretical description of the cycle to its formalization and its measurement. Should the cycle be understood from a single composite indicator such as GDP or on the basis of several proxies of economic activity? How to recognize and measure the cycle, its duration or its amplitude? The enrichment of the literature of the last few years has provided a multitude of

answers to these issues and has made some progress in explaining the theoretical and methodological issues of economic cycles.

Regarding the selection of the indicator (s) tracking the cycle, a majority of researchers starting from Burns and Mitchell (1946) have chosen real GDP as the best estimate of economic activity and to a lesser extent industrial production when higher frequencies are being considered. The advantages of using real GDP are evident according to Bodart, and Shadman-Mehta Kholodilin (2003) who see it as a solid way to remove the uncertainty in choosing among the dating of turning points when multiple economic indicators are utilised. Despite their imperfections, including the fact that it does not account for phenomena such as the environment or informal activities, the GDP indicator is commonly employed to synthesize economic information essential to the period. It is probably this fact that further motivates economic research institutes to adopt GDP as a benchmark for the timing of the cycles. This is the case of the NBER and the OECD which are among the agencies showing a long and rich experience in the field of economic cycle analysis.

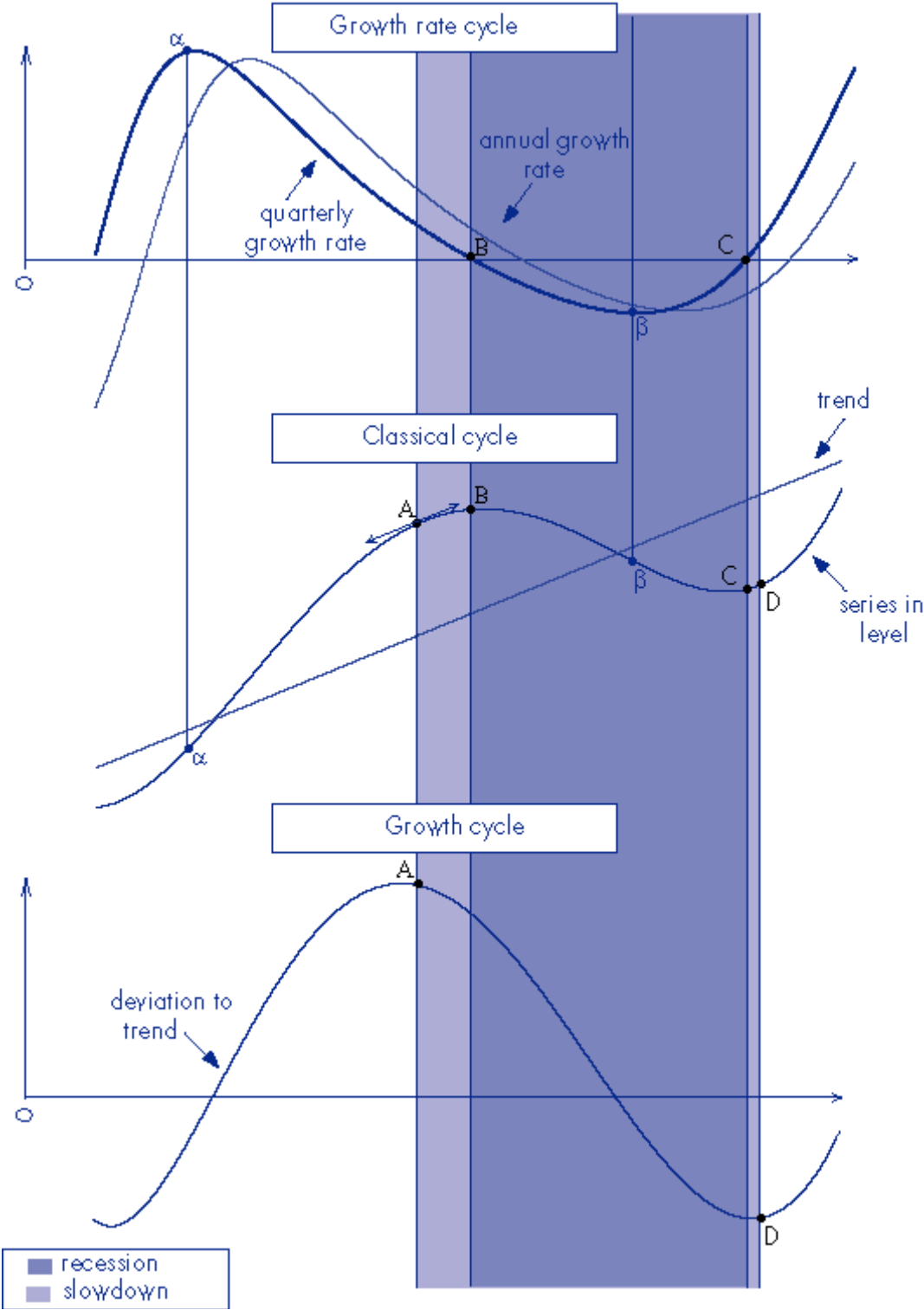
With regard to the definitions of the business cycle, Harding and Pagan (2004) reported confusion in the interpretation of the cycle. They emphasized that the various investigative techniques to describe and measure the cycle are not always complementary and may even be conflicting if they are not properly used. Harding and Pagan stated that the identification of cycles can be approached either directly on the raw data series of GDP,  $y_t$ , the difference between the component and its permanent,  $z_{1t}$  or the rate of growth of  $y_t$ ,  $z_{2t}$ . In addition to the use of the wrong terminology to describe one of these three categories of the cycle, the confusion has also been created by some econometric studies that combined the algorithms dating the cycle and the decomposition time series techniques incorrectly. Harding

and Pagan have rightly pointed out their surprise at the results obtained by some empirical researchers who has mixed the use of the NBER method and that of Hodrick and Prescott (...). Of these contributions initiated by Harding and Pagan and work that followed, especially by authors such as Anas and Ferrara (2002), it is now accepted that the business cycle can be analyzed according to three main approaches, with, each one possibly giving a different chronology of turning points.

Outside the walls of academia and public bodies, the progress of monitoring cyclical activity was also driven by industry players. The Centre d'Observation Economique (COE), originally attached to the Chamber of Commerce and Industry of Paris, has developed a graphical approach known as ABCD, shown in Figure 1, to present the distinction between the three cycles mentioned above. The business cycle defined by Burns and Mitchell (1946), also called the classical cycle is chosen to describe the changes in overall activity in an economy. A trajectory is drawn showing turning points, the famous peaks and troughs (called B and C in Figure 1), which oppose the periods of negative growth (recession) and those of positive growth (expansion). In mathematical terms, these turning points coincide with times when growth is zero and become negative or positive, indicating the inputs and outputs of recessions.



**Figure 1: Evolution of Cycles and the ABCD Approach**



Source: [Coe-Rexecode](#)

The growth cycle, also known as the deviation or differential cycle, considers the fluctuations of the GDP series (or another reference series) from its long-term trend. In the context of the scarcity of episodes of decreased level of economic activity that has often prevailed over long periods in developed countries, and eras of expansions such as in the 1990s in the US, forecasters have noted the rather restrictive framework of the business cycle and focused their attention on the additional information provided by the growth cycle. In practical terms, the GDP indicator requires prior extraction of the cyclical component. It is from this that the detection of periods of contractions is taken. Indeed, there is contraction when the cyclical component is negative, that is to say when the rate of economic growth falls below its potential growth rate. Graphically, the turning points, named A and D in Figure 1 allow a clear interpretation: the peak (point A) is when the growth rate falls below the trend rate of growth and, conversely, the trough (point D) represents the time when it rises above the trend growth rate. This cycle is also called the acceleration cycle, and of course, the calculation refers to the changing pace of growth. In Figure 1, the phases are defined by peaks (point  $\alpha$ ) and valleys (point  $\beta$ ), which represent the local maxima and local minima reached by the growth rate.

Compared to the other two cycles, the interpretation of the phases is much more difficult. It may indeed be wrong to suggest a slowdown when the growth rate experienced a fall. Taking the example that quarterly GDP would increase from 2% to 3% a year, it would be incorrect to conclude that a slowdown occurred as GDP could continue to grow at a point above potential growth. This remark also prevails for the reverse recovery: a mistake may be made of diagnosing an economic recovery by noting that growth rose from -2% to -1%. Indeed, the growth rate increases but remains negative, implying a decrease in activity, that is to say a recession. It is important to note that despite these difficulties, the acceleration cycle

continues to be a concept mostly used by economists, especially those in the economic institutes of economic analysis. Empirical follow-up is usually captured through the year on year, or quarterly growth rate which leads to a cycle that is more volatile and more difficult to discern. However, as with the NBER, the exercise of its dating is one of the missions of the Economic Cycle Research Institute (ECRI), which provides and regularly updates the chronology of the cycle acceleration for two dozen countries (see the website <http://www.businesscycle.com/>).

### ***2.3. The Challenges of Identifying Cycles in the Caribbean***

The dating of turning points in the cycle is undoubtedly a crucial activity for the study of economic fluctuations. First, it largely determines the content of the information disseminated about the description of the characteristics of business cycles, that is, the distinction between the three types of cycles, frequency of turning points, the duration of up and down swings, the symmetric or asymmetric nature of these phases, their average length and variability, etc. It is also essential to properly address the comparison of profiles of cycles of different countries, especially those aimed at characterizing periods of recession and economic expansion synchronization at the international level. In a purely domestic sense, it is of great importance when classifying economic indicators based on their lagging, coinciding or leading character, compared to the reference cycle. Finally, it contributes significantly to the information that must be crafted to inform policy makers in their choices: to anticipate the effects of the imminent arrival of a turning point for better understanding the consequences of situations of recession and expansion and so on.

For about 90 years there has been a flowering of research and results devoted to the dating and documenting of the economic cycles for the US. The monopoly of the NBER has been

eroded by the introduction of a number of distinguished organizations, attached to ministries and other public bodies as well as businesses. Among the entities that have invested in the performance of the dating of the cycles include: The "Conference Board", founded in 1916 in the US, publishes information on the cycles of major industrialized countries; The ECRI, established in 1996, sells economic analysis and forecasting information as well as publishes its own diagnostics and results on the global economy and the cycles of twenty countries; The CPER formed in 2003 to establish the chronology of the classic cycle for the euro zone; The Reserve Bank of South Africa determines the turning points of the business cycle in South Africa and has published since the 1970 related studies in its quarterly newsletter (see Venter (2005)).

The painful events of the crisis of 2008 highlighted the increased risks of U.S. banks, financial markets and states debt, and showed how the expertise provided by these different business cycle institutes are needed to better identify and reach decisions. The usefulness of these organizations is also related to their role in spreading the feeling of confidence which is so dear to the health of the economy.

The considerations just mentioned are perfectly valid as regards the problems of business cycles in the nations of the Caribbean. For a country or an economic community emanating from a supranational entity, it is clear that the possession of a reference chronology of dates of the beginning and end of recessions is of great importance. Within the Caribbean, this process of official dating of the cycle is not yet effective in most of the countries just as it is not for the CARICOM area as a whole where there is still need for coordination of economic policies of the member states. It goes without saying that an approach to generalize and formalize the

pioneer academic papers (Whyte (2008), Craigwell and Maurin (2007a, 2007b), Cashin (2004)) in this area is a track that should be followed.

### **3. Dating of Business Cycles of Caribbean Countries**

#### ***3.1. The Data***

Today, in light of the findings made by different authors during the 2000s (see for **example???**), it is still distressing to observe that the databases at high frequencies are still largely unavailable. In the case of real GDP, which remains the key indicator of the system of economic accounts of the nations, there are no quarterly series of long enough spans for the majority of Caribbean countries. Liu and Romeu (2011, **p....**) states that, "The lack of timely reporting of quarterly GDP in some countries present difficulty in the assessment of current economic conditions ... While increasingly uncommon among emerging market economies, many countries do not report quarterly GDP growth at all - a number of these cells are found in the Caribbean - , and the availability of timely indicators of economic activity is even more important for policy makers in economic theory."

In fact, of the fifteen member countries of CARICOM only one third of them formally have quarterly estimates of GDP and of long enough periods to allow estimation of several complete cycles. These are Barbados, Jamaica, and Trinidad and Tobago for which the series dates from 1970. Of the wider Caribbean basin data exists from 1980 for the Dominican Republic and The Bahamas. For the other countries, the time intervals covered by the existing data are too limited to allow attempts at dating the business cycle and reviewing their characteristics.

In the case of Barbados, the quarterly output series is provided by the Central Bank of Barbados and was originally developed by Lewis (1997) constructed from estimates of the economic sectors using employment. The data covers the period from the first quarter of 1974 to the second quarter of 2011, four decades of economic developments, which is more than enough to study the cycles observed in this country.

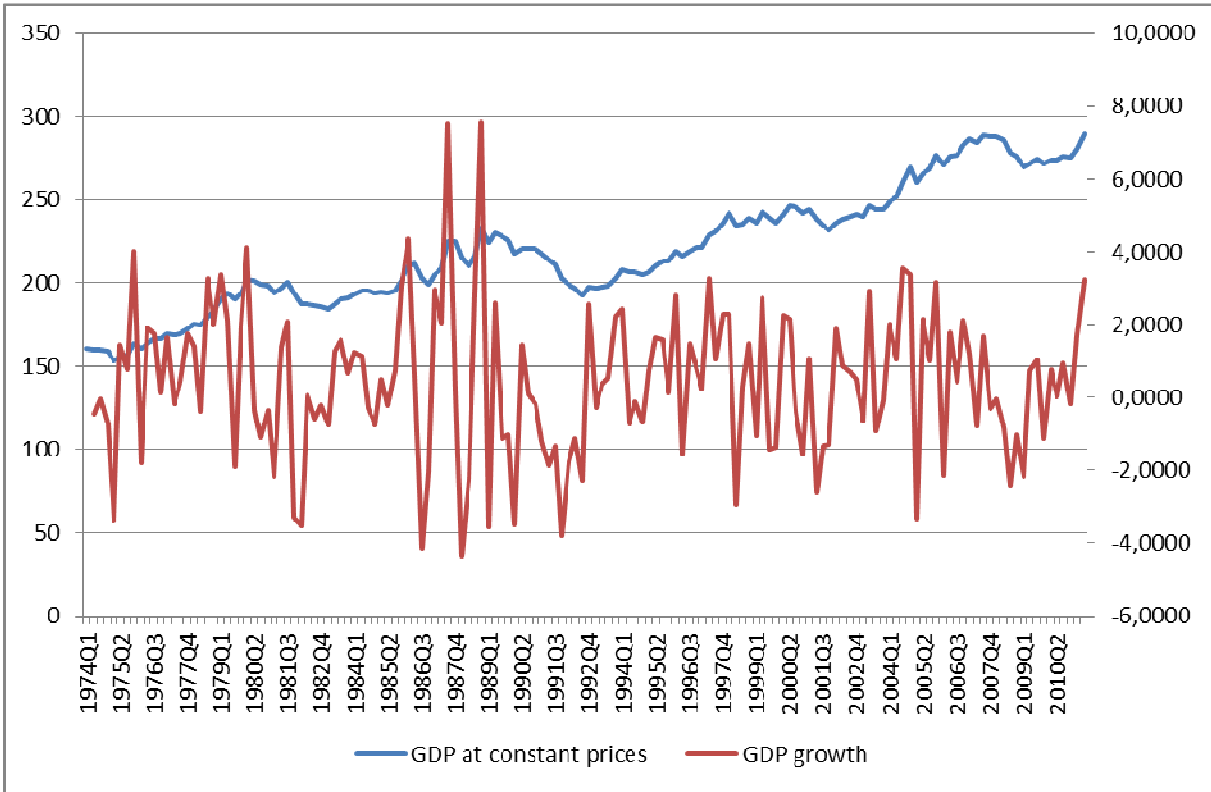
The early data used for Trinidad and Tobago – 1971 to 1999 - are those developed by Watson (2003) applying the temporal disaggregation procedure of Goldstein and Khan (1976). The rest of the data – 2000 to 2011 - is sourced from the Central Bank of Trinidad and Tobago.

Finally, the series for Jamaica's GDP is taken from the database of the Central Bank and is the standard used by Serju (2006). Unlike Barbados and Trinidad and Tobago, it is only available over the period 1985: Q1 to 2011: Q4.

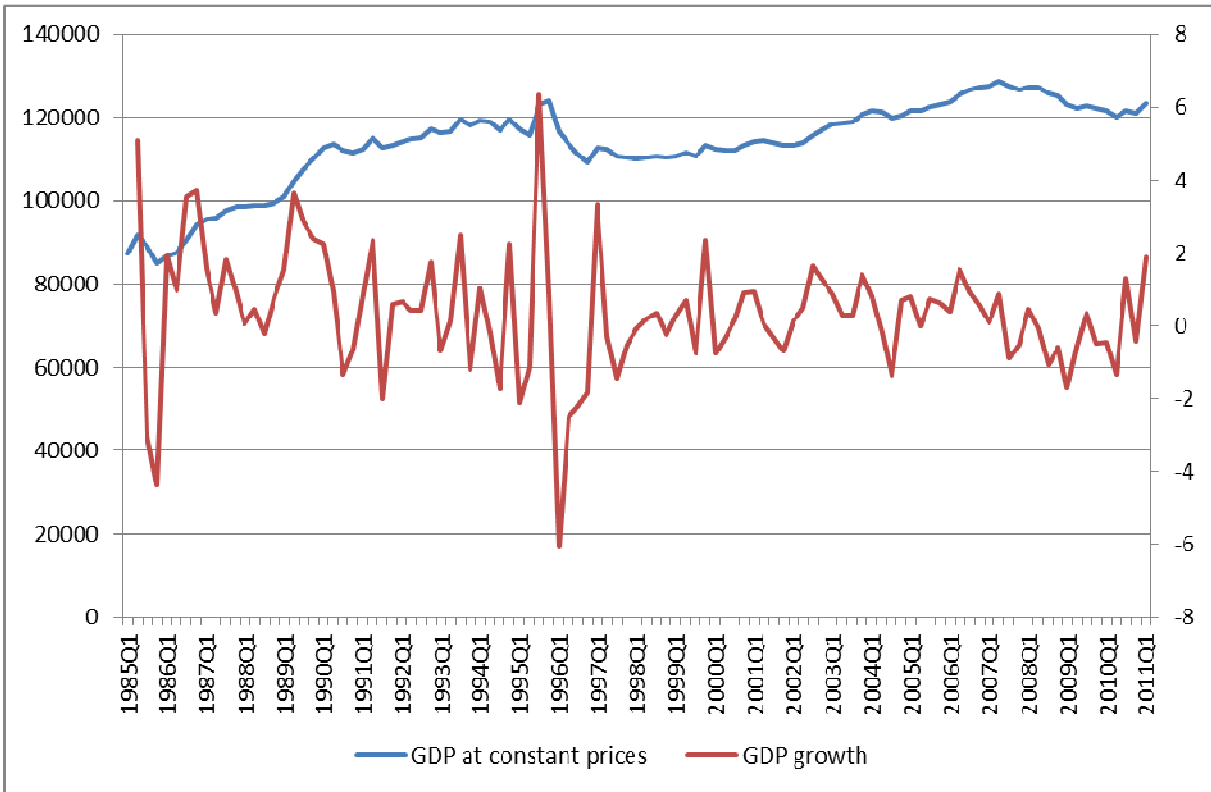
### ***3.2. Stylized Facts***

The three Caribbean GDP variables revealed different short-term economic fluctuations largely because of the reactions of the national economies to external shocks. For example, the oil shocks would have caused prosperity for the oil-rich country of Trinidad and Tobago and decline for the other two non-oil economies. Without trying to be very explicit about the facts explaining the economic movements in these three Caribbean islands, which is outside the scope of this article, some major elements will be highlighted.

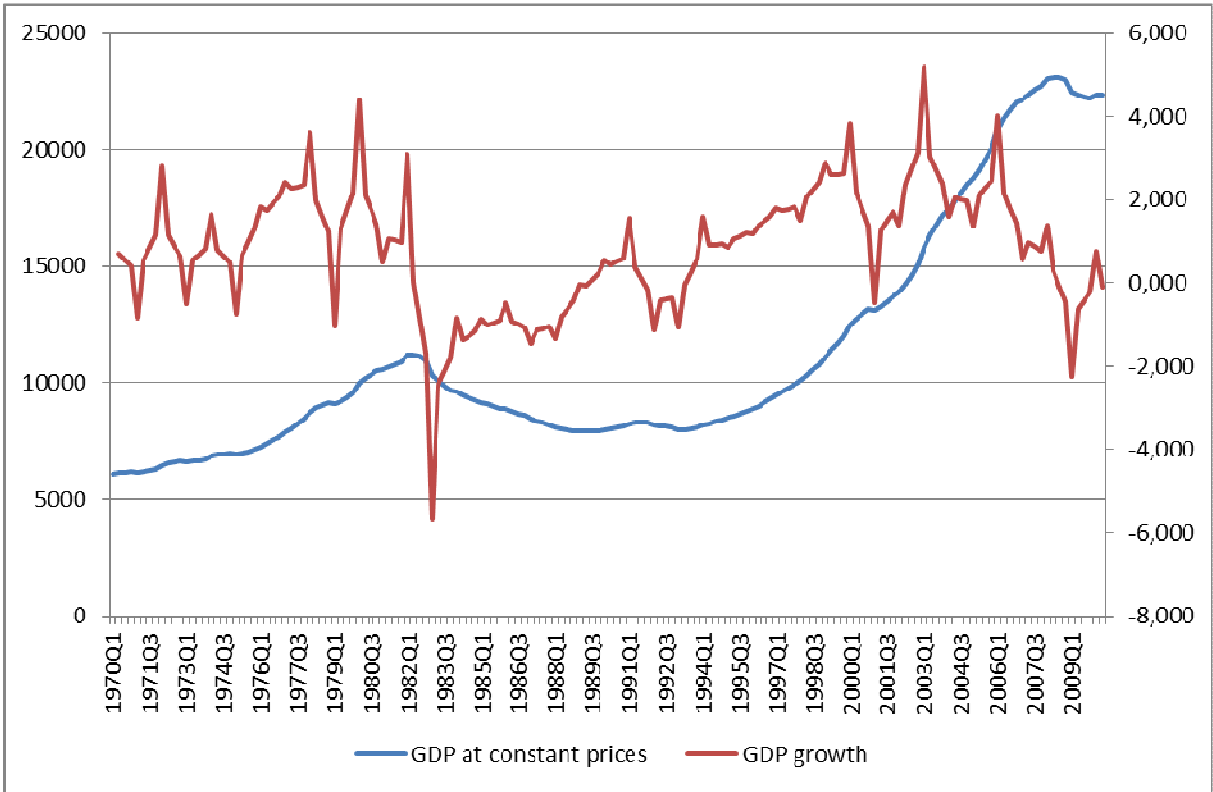
**Figure 2: GDP Growth in Barbados over the Period 1974:2-2011:2**



**Figure 3: GDP Growth in Jamaica over the Period 1974:2-2011:2**



**Figure 4: GDP Growth in Trinidad and Tobago over the Period 1974:2-2011:2**



**Barbados**

Barbados’ growth pattern since the early 1970s reveals several episodes.

- The period 1971 to 1980 can be termed the phase of diversification and growth. Investments and public policies were put in place to increase activity in tourism and the industrial sector as sugar production was on the decline.
- The period 1980 to 1992 corresponds to an era of slower and decreasing growth, particularly under the effects of two oil shocks. The second oil shock in 1979/1980 produced a long and deep recession that resulted in a decline in productivity between 1981 and 1982. From 1983 to 1986, optimism resurfaced through the growth in tourism. However after this period the economy started to show signs of exhaustion, and the dynamism, which has long been a boost to the economy, disappeared. Real GDP fell by 3.1% in 1990 and 4.1% in 1991 and 6.2% in 1992.



- The 1993 to 2000 period is one of renewed growth, following the implementation of the austerity measures under the structural adjustment programme of the International Monetary Fund (IMF). The Barbados economy grew for eight consecutive years, mainly due to tourism and financial services.
- The period from 11 September 2000 to the end of 2001. The terrorist attacks of September 11 severely hampered value added in the major sectors of the Barbados economy, such as tourism and manufacturing.
- The period 2002 to 2007. Given the expansion in public spending, tourism and real output recovered. The economy grew in 2003 and was maintained at more than 3.9% over 2005 (3.9%), 2006 (3.6%) and 2007 (3.8%).
- The period from 2008 to the present day. Like most countries in the world, Barbados was negatively affected by the ‘great recession’ that commenced in late 2008. In 2008 the economy declined by 0.2% and in 2009 it experienced the worst performance since 1970, contracting by 5.5 %. Real output continued to fall in 2010.

### ***Jamaica***

Like Barbados, there are significant fluctuations in the real output series of Jamaica.

- Between 1974 and 1980, the economy was largely affected by rising oil prices, resulting in a cumulative 16% drop in real GDP.
- From 1980 to 2000. Between 1981 and 1990 the average annual growth rate of real GDP was 1.6%. This is due to a very strict policy adjustment, and low export prices for bauxite and aluminum. A high rate of inflation in the 1980s also accentuated the decline in the growth rate post 1988. Inflation increased successively by 6.8% and 5.5% in 1989 and 1990 to 0.5% in 1991, and then registered levels of less than 1.4% until 1995. In 1996 and 1997, the recession started again until the end of the 2000s, when slow growth was recorded. For the twenty year

period from 1981 to 2001, real GDP in Jamaica grew at an average annual rate of 1.5%, but this increase was somewhat erratic, with periods of very slow growth, especially those between 1981 to 1986 and 1996 to 2001. As stressed by King (2000), these performances of Jamaica were conspicuous when compared to other countries in the region. Indeed, while the average growth in the region was 2.2 % annually during the 1980s, it was only 1.4 % in Jamaica. Between 1991 and 1996, the gap worsened since the economies of Latin America and the Caribbean registered an average annual rate of growth of 3.0 % while the rate in Jamaica was just 1.3 %. Even within the single Caribbean area, the relatively poor outturn of Jamaica is obvious. The average growth rate for the period 1980 to 1996 is 3.0%, while Jamaica managed only 1.4 % annually over the same period.

- The 2000s for Jamaica and indeed the Caribbean was also a time of erratic GDP movements. For Jamaica, real output rose by 0.4% in 2001, decreasing to near 0% in 2002 to peak at 4.09% in 2003 and then modest growth rates of 1.4 and 1.1% were recorded in 2004 and 2005. The year 2006 saw some rebound since real economic activity expanded by 3%. However, this was followed by a fall in 2007 to 1.4% and low negative levels in 2008 (-0.9%), 2009 (-3.0%) and 2010 (-0.1%). This high frequency of contractions and limited growth of the Jamaican economy has motivated many studies to investigate the causes. Blavy (2006), Bourne (2008) and Thomas and Serju (2009) have highlighted a diversity of explanatory factors ranging from domestic and external shocks (e.g. financial sector crisis, hurricanes, oil prices, etc), high debt level, crime, migration, exchange rates to relatively high inflation. In addition, there is the role of the informal economy which contributes to higher than officially measured growth rates.

## *Trinidad and Tobago*

In the early 1970s, the structural changes that led to the current configuration of the Trinidad and Tobago economy began. They are related to new discoveries of oil and natural gas.

- The period of the 1970s. The rapid rise in international prices in the 1970s led to strong export and GDP growth.
- The period of the 1980s. Production declined during the 1980s due to the stabilization of oil prices between 1981 and 1982 and a decline in 1983. The economic impact was considerable. Indeed, there was a contraction in real GDP annually between 1983 and 1989. During the period 1980 to 1990 real GDP fell by an average of 4.7% per annum compared to a rise of 5.9% between 1970 and 1980.
- The period between 1990 and 1993. In 1990, GDP rebounded with growth of 1.7% and 3.1% a year later. These positive results can be explained in part by the rising price of oil caused by the conflict in the Persian Gulf. But in 1992, with the end of the war, production fell again, resulting in negative growth rates of GDP until 1993.
- The post 1993 period. After the difficult years, a new "brighter future" appeared in 1994. The government's austerity policies bore fruit: government debt decreased and above all, the Trinidad and Tobago economy experienced remarkable growth rates. Indeed, over the period 1994 to 2008, Trinidad and Tobago registered an average annual increase in economic activity of over 5%. For the sub-period 2004 to 2008, it climbed to an average of 7.5%, the fastest in the Caribbean area. The value of 3.5% observed in 2008 corresponds to the lowest rate since the country emerged from its last severe recession in the 1990s.

Artana et al. (2007) have summed the six decades of growth since the 1950s: "The recent economic history of Trinidad and Tobago shows a period (1950-1973) of high growth with relatively stable international oil prices, a period of high growth with high oil prices (1974-

1982), a long period of negative (per capita) real growth (1983-1993), and the recent boom period. During the years 2009 and 2010, Trinidad and Tobago has not escaped the global economic crisis. The country recorded a negative growth rate of -3.5% in 2009, before returning to a small positive expansion of 1.2% in 2010.

While the Trinidad and Tobago economy seems the most diversified in CARICOM, the fact remains that it is heavily dependent on its industrial sectors "oil, gas and petrochemicals," which account for nearly 50% of its GDP. These concomitant developments in GDP and oil production perfectly reveal the weaknesses of the Trinidad and Tobago economy. The theoretical framework of the Dutch disease is very appropriate in this situation.

### ***3.3. Methodological Approach***

It is well known that the procedure of Bry and Boschan (1971) has been throughout the past four decades the most popular method for detecting turning points in the economy. It consists of a screening procedure under the constraint of ad hoc rules developed by Burns and Mitchell (1946). It was designed to reproduce similar results to those obtained by applying the criteria of the NBER dating. It operates directly on the raw data by selecting the local extrema in the time series of constraints on the length and the amplitude of booms and busts. Basically, it selects a number of would-be turning points (peaks and troughs) and then applies a series of operations to eliminate items that do not meet the criteria characterizing the cycles. It is also less known that various algorithms of the Bry and Boschan method have, from the 2000s, been available in software programs and these programs give different results. The methodological and empirical evaluations of its accuracy and its properties were carried out by several authors who have revisited its basic principles and compared it to alternative methods. Interested in establishing a monthly chronology for the euro area, Monch and Uhlig

(2005) conducted a comparison of Boschan and Bry cycle behavior in pre-war and post-war periods. They found the phenomena of asymmetry of cycle phases; particularly the boom periods were longer in the postwar period than during the pre-war era. The authors proposed an extension of the algorithm with an "amplitude / phase length" criterion. Specifically, Monch and Uhlig have introduced the combined rule "amplitude / phase length" to ensure that the business cycle phases, which are have both short and low amplitudes (flat) are ignored, while those short but pronounced are retained.

In a paper that can be described as an important contribution to the analysis of the duration of business cycles, Everts (2006) expressed surprise that the values commonly adopted as minimum and maximum in the work of many authors are still those of the definition of Burns and Mitchell, derived from very old data (covering the period 1885 to 1931). Everts then discussed the adaptation of quarterly and monthly Bry Boschan algorithms pointing to the problem of determining the period attributed to quarterly cycle phases of 4 and 5 months. Finally, he compared the turning points of U.S. GDP calculated by the procedure of Bry and Boschan and the official dates announced by the NBER: the method of Bry and Boschan detects four business cycles while the NBER defined seven cycles. He then concluded that the procedure is too restrictive and proposed a variant carrying the rewriting of Step 2 (Determination of cycles in a two-quarter moving average (extreme values replaced)).

Regarding the implementation of its computer calculation steps, the least that can be said is that the algorithm of Bry and Boschan has mobilized many of the software programming practitioners. Its original FORTRAN program was implemented under the GAUSS platform by Watson (1994), and at present it is now carried out by a multitude of authors using various econometric softwares such as RATS, MATLAB or SCILAB. In Craigwell and Maurin

(2007a, b) on the cycle of Barbados, a slightly modified RATS program written by Bruno and Otranto was used, which the latter authors translated from the GAUSS code of Harding and Pagan (2002, b). Doan (2009) also did a second RATS implementation from a translation of the code of Harding and Pagan (2002, b). Additionally, in a recent article, Hall and McDermott (2011) refer to a RATS procedure written by one of their co-authors Kim (see **Kunhong**, Buckle and Hall (1995)). MATLAB, a modified version of the GAUSS procedure of Watson has been adopted by Rand and Tarp (2002). More recently, Everts (2011) has also developed a variant of Bry and Boschan using this software. It is therefore not surprising that various authors could obtain different results with the same data. While computer programs dating cycles generally provide satisfactory findings and similar turning points, it is also possible to see different chronologies for GDP and industrial production, especially when these series are related to more volatile economies.

Given all these issues associated with the methodological extension of the algorithm of Bry and Boschan and its computer implementation, it is necessary to decide what computer program should be chosen to use on Caribbean time series. To answer this question note that the characteristic of output volatility is found in developing countries (see for example Agénor et al. (2000) and Rand and Tarp (2002)) and is largely due "instability of the parameters of international integration (terms of trade, level of the exchange rate, capital inflows and outflows) and the shortcomings in internal regulation (versatile policy stance, weak financial systems, recurrence of inflationary slippages) "(Fayolle and Micolet (1997, p. 133)). It follows that a priori output volatility will be more assertive in the cycle of Caribbean countries and a careful choice of methods for identifying turning points in cycles is required. Time should be taken to carefully examine the approaches taken in recent work where the authors have also been faced with these trade-offs between different versions of the Bry

Boschan method. Considering these factors a compromise decision is favoured: the identification of the business cycle from one set of real GDP and an expanded version of Everts (2006) Bry-Boschan algorithm is applied.

### ***3.3. The Chronologies***

The dates provided by the method of Bry-Boschan for the three countries are reported in Table 1. In the case of Barbados, the turning points identified reveal the existence of 10 major peaks and 11 troughs during the period 1975:1 to 2011:2. Clearly, this chronology includes most of the dates of turning points already identified in previous work (Craigwell and Maurin (2007, b)) but it also incorporates new dates associated with the episodes of the cycle of the additional period 2004:1-2011: 2.

The date obtained for the Barbados economy shows that it has recorded eight complete cycles of peak to peak and nine complete cycles of trough to trough. The durations of the various phases of these cycles and their means and standard deviations are summarized in Table 2.

These cycles highlight the following features:

- The average length of peak to peak and trough to trough cycles are respectively 13.75 and 15.1 quarters, or 3.4 years and 3.8 years;
- The average length of the expansion phase (trough to peak) is 10.2 quarters against a contraction phase (peak to trough) of 4.9 quarters, that is the expansion of the economy is two times more than its contraction, and similarly, the amplitude of the cycle during the expansion phase (8.2 quarters) is more than twice that observed in the contraction phase (3.3 quarters);
- The 1970s and 1980s are marked by cycles of shorter durations and smaller amplitudes;
- The longest cycle is recorded in the 2000s, between 2000:2 and 2007:3 for the peak to peak phase and between 2001:4 and 2009:1 for the trough to trough phase;

- The expansion phase between 2001Q4 and 2007Q3 is the most important observed;
- The most severe economic recession occurred between 1989Q2 and 1992Q3, it lasted 13 quarters, slightly more than three years;
- The latest episodes of the cycle for Barbados during the 2000s, show that the economy experienced a severe drop in 2001 and a long period of robust expansion, with an average annual growth rate of 3.9% over the period 2002 to 2007 and during this cycle, the pace of growth has even accelerated at the end, reaching 4.3% in the period 2004 to 2006.

**Table 1: Identification of the Classical Cycles**

Barbados		Jamaica		Trinidad and Tobago	
Peaks	Troughs	Peaks	Troughs	Peaks	Troughs
	1975Q1		1985Q4	1982Q2	1989Q2
1980Q1	1981Q1	1993Q3	1995Q2	1991Q3	1993Q2
1981Q3	1983Q1	1995Q4	1998Q1	2008Q2	
1984Q2	1984Q4	1999Q4	2000Q2		
1986Q2	1986Q4	2001Q4	2001Q4		
1987Q4	1988Q2	2004Q1	2004Q3		
1989Q2	1992Q3	2007Q3	2010Q3		
1994Q1	1994Q4				
2000Q2	2001Q4				
2007Q3	2009Q1				

In Craigwell and Maurin (2007a, 2007b), the internal and external linkages of the cycle of Barbados were analyzed. The fluctuations of GDP were shown to be closely associated with variations in the areas of tourism, trade and construction. Similarly, a strong dependence was observed for the cycles of the Barbadian and U.S. GDP.



**Table 2: Durations of the Phases of the Business Cycle for Barbados**

Peaks	Complete Cycles Peak to Peak	Rising Phases Trough to Peak	Troughs	Complete Cycles Trough to Trough	Decreasing Phases Peak to Trough
			1975Q1		
1980Q1		20	1981Q1	24	4
1981Q3	6	2	1983Q1	8	6
1984Q2	11	5	1984Q4	7	2
1986Q2	8	6	1986Q4	8	2
1987Q4	6	4	1988Q2	6	2
1989Q2	6	4	1992Q3	17	13
1994Q1	19	6	1994Q4	9	3
2000Q2	25	22	2001Q4	28	6
2007Q3	29	23	2009Q1	29	6
Average	13.75	10.2		15.1	4.9
Standard Deviation	8.7	8.2		9	3.3

The chronology for Jamaica, over the period 1985:1-2011:1, shows that it has recorded five full cycles of peak-to-peak, and six complete cycles of trough to trough. As in the case of Barbados, the identification of the business cycle in Jamaica gave a greater number of troughs than peaks. The results here are different from White (2008) for two reasons: the procedure used in this paper allows a better identification of turning points and secondly, the period of analysis. White sample covers the period 1981 to 2007, the data in this paper cover post 2008 which captures the global banking, financial and economic crisis that originated with the U.S. subprime crisis in the summer of 2007.

**Table 3: Durations of the Phases of the Business Cycle for Jamaica**

Peaks	Complete Cycles Peak to Peak	Rising Phases Trough to Peak	Troughs	Complete Cycles Trough to Trough	Decreasing Phases Peak to Trough
			1985Q4		
1993Q3		27	1995Q2	42	7
1995Q4	9	2	1998Q1	11	9
1999Q4	16	7	2000Q2	9	2
2001Q2	6	4	2001Q4	6	2
2004Q1	11	9	2004Q3	11	2
2007Q2	13	11	2010Q2	23	12
Average	11	10		17	5.67
Standard Deviation	3.40	8.16		12.37	3.94

Murray (2007) also identified turning points for Jamaica but using a structural VAR model.

These results were relatively close to the description found here.

- Measured from peak to peak five complete cycles were experienced with an average duration of 11 quarters and a standard deviation of 3.4 quarters and conversely, from trough to trough six complete cycles were identified with an average of 17 quarters and a standard deviation of 5.67 quarters;

- Booms have a duration which varies between 2 and 27 quarters, for a mean duration of 10 quarters and variability of 8.16 quarters;

- periods 1985:4-1993:3 (27 quarters), 2001:4 -2004:1 (9 quarters) and 2004:3-2007:2 (11 quarters) appear to be the longest period during which the economy of Jamaica has undergone some improvement;

- During this period of nearly three decades, from 1985 to 2011, the Jamaican economy has experienced six recessions with three recorded between 1985 and 2000 and also three

occurring between 2001 and 2010, three of these recessions were short or two quarters, the two longest recessions, respectively 9 and 12 quarters, occurred between 1995:4 and 998:1 and 2007:2 and 2010:2.

Trinidad and Tobago is one of those countries where hitherto there has not been dating of its cycles using modern analytical approaches. It is true that several studies have given some insights into the Trinidadian business cycles (see Cashin (2004), Calderón (2007), Bourne (2008), Yan and Samuel (2009), Male (2009) and Martínez and Montesinos (2009)). However, these studies have utilised qualitative or annual data. Therefore, the results presented here enriched the documentation of the characteristics of the economic cycle of Trinidad and Tobago.

Table 4 shows that the turning points identified are small in numbers: 1982Q2, 1991Q3 2008Q2 for the peaks and 1989Q2 and 1993Q2 for depressions. The first peak to peak cycle began in the second quarter of 1982 and lasted 37 quarters through to the third quarter 1991. This cycle reached its minimum in the second quarter of 1989. The second peak to peak cycle commenced in the third quarter of 1991 and completed in the second quarter of 2008, a long period of nearly 17 years. This cycle recorded a dip in 1993 Q2. The single cycle of trough to trough covers the period from 1989:2 to 1993:2 for a period of 16 quarters.

**Table 4: Durations of the phases of the business cycle for Trinidad and Tobago**

Peaks	Complete Cycles Peak to Peak	Rising Phases Trough to Peak	Troughs	Complete Cycles Trough to Trough	Decreasing Phases Peak to Trough
1982Q2			1989Q2		28
1991Q3	37	9	1993Q2	16	7
2008Q2	67	60			
Average	52	34,5		16	17,5
Standard Deviation	15	25,5			10,5

In a very interesting article, Bourne (2008) developed a description and analysis of the history of business cycles in the Caribbean and the most common mechanisms that explain their appearances:

"Many factors help to explain the course of aggregate economic activity in the Commonwealth Caribbean. They include external economic variables such as aggregate income and demand in the major trading partner economies, financial capital flows, domestic fiscal policy and natural hazard events. From time to time the relative importance of these variables may change. The behavior of the U.S. and UK economies is a chronic influence“(p..).

In the case of Jamaica, Murray (2007), for example, emphasized the influence of climatic conditions on business cycles. Indeed, being very sensitive to weather conditions, agricultural production, tourism, mining and quarrying accounted for nearly two thirds of annual income for many countries.

**4. Dating Growth Cycles and Accelerating Caribbean Countries**

In reality, the evidence from many countries that employ monthly or quarterly data have shown that there is an absence of conditions for troughs and peaks over long periods. Thus, even if the economy is decelerating (accelerating), there is no possibility of moving from the

latter state (decelerating (accelerating)), into one of recession (expansion). Specifically, to trace these behaviours and recognize the distinction of transforming from the classical cycle to a recession or expansion the deviation of the cycle must be utilized.

Recent work have discussed the complementarity of these two notions of the business cycle.

Destais, Lecuyer, Mazzi and Savio (2005), for example, lament that:

"It is important to note that the growth cycle fits completely within the business cycle defined by Burns and Mitchell, but instead of identifying points of a weakening trend, it aims to identify points of acceleration and deceleration of economic activity. These two approaches of measuring cycles, while different, are complementary phases of acceleration and deceleration and can well meet during one phase of the classic expansion or recession."

From this point of view, it is understandable that the procedure of Bry and Boschan may also be used for dating the growth cycle of a series. This identification of the turning points will however occur on the cyclical component of the indicator used to represent economic activity. It therefore requires the implementation of a trend-cycle decomposition in the preliminary stage.

Trend-cycle decomposition techniques grew significantly in the 1990s and 2000s. There was an accumulation of at least a dozen methods of cycle extraction, the most known are the procedures of Hodrick and Prescott (1980), the band-pass filter of Baxter and King (1995) and Christiano and Fitzgerald (1999, 2003) along with the unobserved components model of Harvey (1989). This abundance of trend-cycle decomposition methods is largely due to the increase in comparative performance empirical studies and the search for a robust technique. Bentoglio, Fayolle and Lemoine (2001), and Ladiray and Soares (2001), Guay and St-Amant (2005) and Ahamada and Jolivaldt (2010) conducted research on a global scale using these different methods of extracting the trend and found that the various estimates of the cycles were near and reveal the same information about the characteristics of growth and periods of recession.

Because it has some optimal properties and is easy to implement and is used by a majority of economists and many national or international organizations, the method of Hodrick and Prescott (1980) is applied here. Profiles obtained from the growth cycles are shown in Figures 7 to 10. For the sake of comparison, the cyclical components provided by Baxter and King method have also been included on these charts. Undoubtedly, the methods show, for each country, strong similarities in the shape and location of the cycle peaks and troughs.

The investigations on dating growth cycles indicate that the economies of Barbados, Jamaica and Trinidad and Tobago have experienced more turning points than business cycles over their respective periods of 1974 to 2011, 1985 to 2010 and 1970 to 2011. Tables 5 to 8 present the summary statistics of these cycles. In the case of Barbados, there are 12 complete cycles from peak to peak and also 12 from trough to trough; the average duration and variability are almost identical. The growth cycles of Jamaica is characterized by mean durations of 10.5 and 14 quarters respectively for observations from peak to peak and trough to trough. As for Barbados, Jamaica's cycle has a strong asymmetry, with downturns much shorter than upswings. In Trinidad and Tobago, as the events of the business cycle were rare, the growth cycles are much less common. In fact, for Trinidad and Tobago, the results indicate that it is an economy with cyclical fluctuations that is particularly representative of a growth cycle. It is worth noting here that the qualitative observations of Bourne (2008) are consistent with this sequence of phases of growth that have been identified. Indeed, his explanations below are well reflected in Table 5 in terms of dates, duration and characteristics of recessions:

“The deep recessions during the 1980s were in Guyana (25% between 1982 and 1985), Trinidad and Tobago (19% between 1985 and 1989) and St. Lucia (12% in 1976). In 1982, world petroleum prices began to decrease, falling by mid-1986 to \$8 per barrel. For Trinidad and Tobago, this was calamitous... The result was an economic recession of major proportions, both in terms of magnitude and duration... During the 1990s, Trinidad and Tobago experienced another deep recession of 14% between 1992 and 1993 as did Barbados whose per capita real GDP fell by 14% between 1990 and 1992.”

Furthermore, it is important to note that the datings identified for the growth cycles include a majority of periods characterized as peaks and troughs defining growth cycles. When the focus is on a common era, that is to say, the years 1985 to 2011, these chronologies of the growth cycles of the three countries also provide some lessons:

- The frequency of the growth cycles is variable for the three economies (about 9 to 10 for Barbados, 6 to 7 for Jamaica and 5 for Trinidad and Tobago);
- Cycle characteristics also vary: Trinidad and Tobago cycles observed from peak to peak and trough to trough were the longest, and also the downturns and acceleration are of the same average length, in contrast to Barbados, where the different phases are much shorter, almost six quarters less for cycles, and three quarters less for upswings and downswings. For Jamaica it was found that the most pronounced asymmetry in terms of time is between phases of expansion and recession.

Figure 7. Cycle de croissance de la Barbade

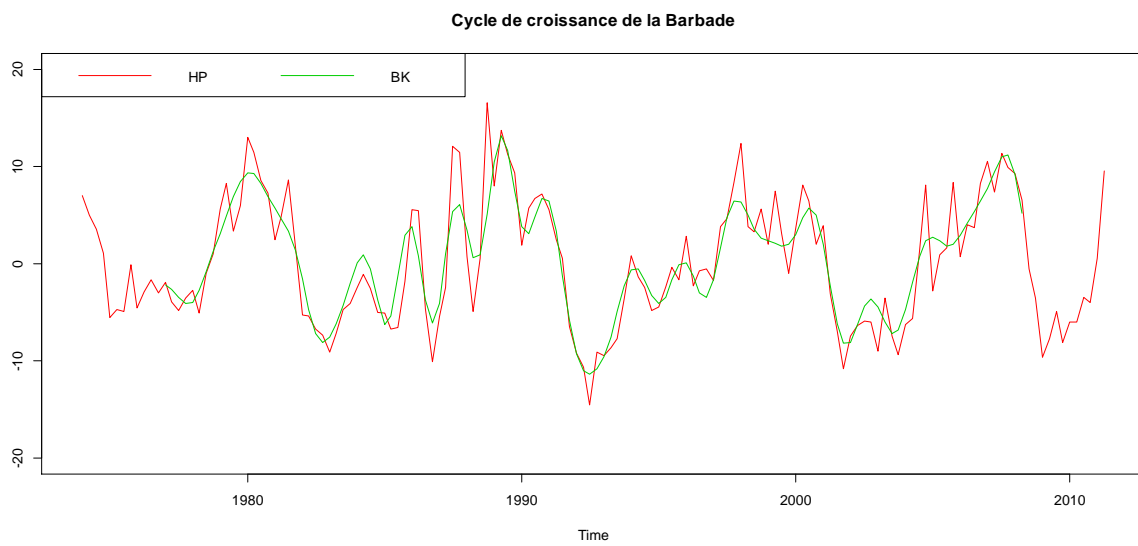


Figure 8. Cycle de croissance de la Jamaïque

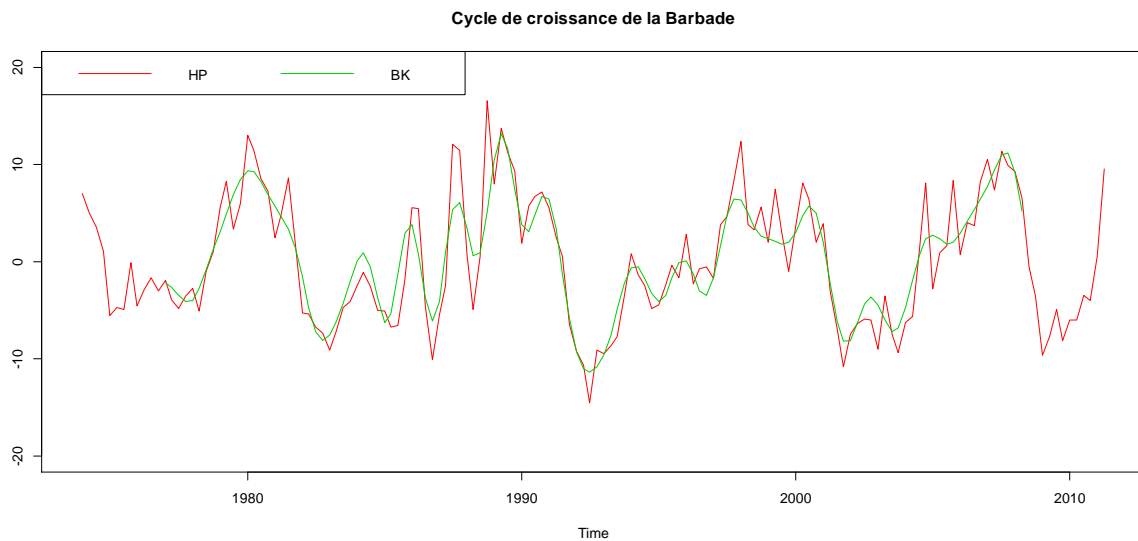
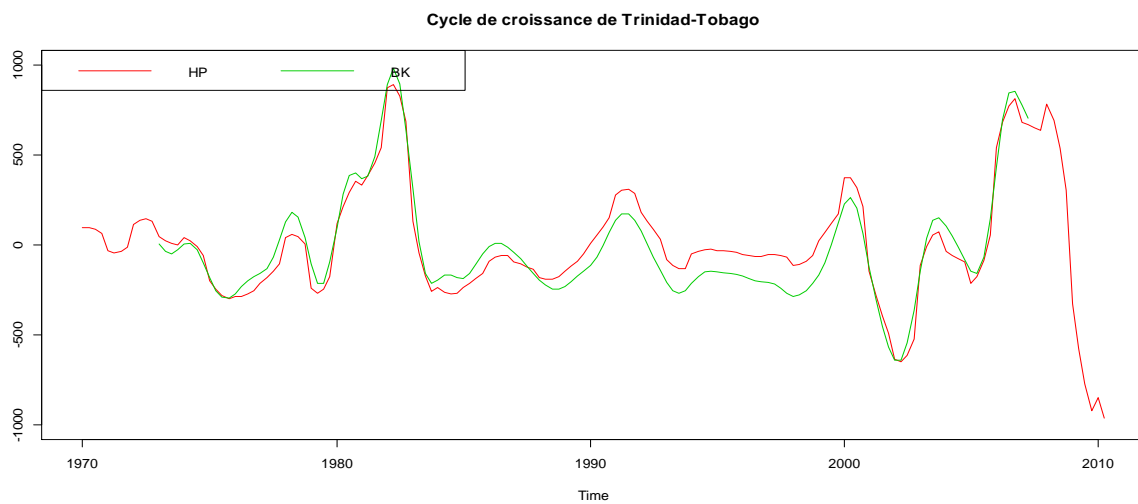


Figure 9. Cycle de croissance de Trinidad et Tobago





**Table 5: Identification of Growth Cycles**

Barbados		Jamaica		Trinidad and Tobago	
Peak	Trough	Peak	Trough	Peak	Trough
1975Q4			1985Q4		1971Q2
1980Q2	1977Q3	1987Q1	1988Q4	1972Q3	1975Q4
1981Q3	1981Q1	1990Q2	1991Q3	1978Q2	1979Q2
1984Q2	1983Q1	1993Q3	1995Q2	1982Q2	1984Q3
1986Q1	1985Q2	1995Q4	1996Q4	1986Q4	1988Q2
1987Q4	1986Q4	2001Q1	2002Q1	1991Q3	1993Q3
1989Q2	1988Q2	2004Q1	2004Q3	1994Q4	1998Q1
1994Q1	1992Q3	2007Q2	2010Q2	2000Q2	2002Q2
1996Q1	1994Q4			2003Q4	2005Q1
1998Q1	1996Q3			2006Q4	
2000Q2	1999Q4				
2003Q2	2001Q4				
2007Q4	2003Q4				
	2009Q1				

**Table 6: Durations of the Phases of the Growth Cycle for Barbados**

Peaks	Complete cycles peak to peak	Rising Phases from trough to peak	Troughs	Complete cycles trough to trough	Falling Phases from peak to trough
1975Q4					
1980Q2	18	11	1977Q3		7
1981Q3	5	2	1981Q1	14	3
1984Q2	11	5	1983Q1	8	6
1986Q1	7	3	1985Q2	9	4
1987Q4	7	4	1986Q4	6	3
1989Q2	6	4	1988Q2	6	2
1994Q1	19	6	1992Q3	17	13
1996Q1	8	5	1994Q4	9	3
1998Q1	8	6	1996Q3	7	2
2000Q2	9	2	1999Q4	13	7
2003Q2	12	6	2001Q4	8	6
2007Q4	18	16	2003Q4	8	2
			2009Q1	21	5
Average	10.67	5.83		10.5	4.85
Standard Deviation	4.80	3.83		4.57	2.96

**Table 7 : Durations of the Phases of the Growth Cycle for Jamaica**

Peaks	Complete cycles peak to peak	Rising Phases from trough to peak	Troughs	Complete cycles trough to trough	Falling Phases from peak to trough
			1985Q4		
1987Q1		10	1988Q4	12	7
1990Q2	13	6	1991Q3	11	5
1993Q3	13	8	1995Q2	15	7
1995Q4	9	2	1996Q4	6	4
2001Q1	21	17	2002Q1	21	4
2004Q1	12	8	2004Q3	10	2
2007Q2	13	11	2010Q2	23	12
Average	10.5	8.86		14	5.86
Standard Deviation	3.64	4.29		5.66	3.00

**Table 8: Durations of the Phases of the Growth Cycle for Trinidad and Tobago**

Peaks	Complete cycles peak to peak	Rising Phases from trough to peak	Troughs	Complete cycles trough to trough	Falling Phases from peak to trough
			1971Q2		
1972Q3		5	1975Q4	18	13
1978Q2	23	10	1979Q2	14	4
1982Q2	16	12	1984Q3	21	9
1986Q4	18	9	1988Q2	15	6
1991Q3	19	13	1993Q3	21	8
1994Q4	13	5	1998Q1	18	13
2000Q2	22	9	2002Q2	17	8
2003Q4	14	6	2005Q1	11	5
2006Q4	12	7			
Average	17,12	8,44		16,87	8,25
Standard Deviation	3,82	2,75		3,22	3,15

## **Conclusion**

Depuis les périodes telles celles de la grande dépression de fin des années 1930 et les chocs pétroliers des années 1970 et 1980, il ne fait pas de doute que l'actuelle période de crise post grande récession apparait comme l'une des fenêtres historiques les plus en vue concernant l'intérêt pour les cycles économiques.

Qu'il s'agissent des entreprises en quête permanente de climat de confiance pour la conduite de leurs activités, des gouvernements devant optimiser les impacts de leurs politiques conjoncturelles ou des ménages acceptant de moins en moins les dommages collatéraux des difficultés économiques, il est clair que désormais, la caractérisation et la prévision des fluctuations cycliques sont au centre des préoccupations des agents économiques.

Prenant ses ancrages dans les travaux pionniers du NBER des Etats-Unis, le processus officiel de documentation des épisodes des fluctuations économiques a gagné progressivement une majorité de pays, ceux de l'Europe d'abord puis la diversité des pays émergents et en voie de développement.

L'heure caribéenne a également sonné avec les premiers travaux engagés par Cashin (2004), Craigwell et Maurin (2007a, 2007b) ou encore White (2008).

A la manière de la littérature moderne établie pour les pays industrialisés, il relève d'une urgence impérieuse de poursuivre les réflexions et contributions sur le cycle économique au sein de la Caraïbe et l'exploration des réponses aux problématiques qui en sont liées. D'un acteur économique à l'autre, il importe en effet aujourd'hui d'optimiser les décisions et arbitrages face aux épisodes de récession ou ralentissement conjoncturel et inversement, face aux phases d'expansion ou accélération.

Les développements présentés dans cet article s'inscrivent dans toutes les considérations qui viennent d'être évoquées. Un premier apport de notre travail se situe dans l'exercice de

datation et de description du cycle. En choisissant le trio de pays pour lequel les données infra-annuelles sont disponibles, nous avons élaboré les chronologies des cycles des affaires et des cycles de croissance de trois économies importantes de la zone de la Caraïbe anglophone, à savoir la Barbade, la Jamaïque et Trinidad et Tobago. Une seconde utilité de nos investigations est d'apporter des éclairages sur l'importante problématique de la synchronisation des cycles réels de ces pays, en examinant en particulier si leurs économies affichent des comportements similaires ou non durant les phases de contraction et d'expansion du cycle. Troisièmement, nous avons également reproduit cet exercice de comparaison des cycles vis-à-vis de ceux des principaux pays développés qui sont en lien avec la Caraïbe.

Enfin, notons que les résultats synthétisés dans notre article laissent entrevoir la nécessité de mise en place des conditions pour impulser des démarches de datation officielle des cycles économiques qui ne sont pas encore effectives dans la quasi majorité des pays caribéens tout comme elles ne le sont pas pour l'espace CARICOM. Or, à l'instar des zones économiques telles que l'exemple phare de l'Union Monétaire Européenne et l'Union Economique et Monétaire Ouest Africaine créée le 10 janvier 1994, la question de la coordination des politiques économiques des Etats membres recouvre de nombreux enjeux qui reposent sur l'alignement de leurs cycles économiques.

De notre point de vue, le chantier dédié à la réflexion sur l'identification des cycles économiques de l'espace CARICOM doit débiter. Il est certain qu'il interpelle les acteurs impliqués dans la production de données statistiques pour leur contribution à la construction de base de données de séries temporelles annuelles et infra-annuelles cohérentes pour le plus grand nombre de pays de la zone.

## References

Agénor, P. McDermott, J. and E. Prasad (2000), "Macroeconomic Fluctuations in Developing Countries: Some Stylized Facts", *The World Bank Economic Review*, Vol. 14, No 2, 251-285.

Adanero-Donderis M., Darné O. et Ferrara L., 2007, Deux indicateurs probabilistes de retournement cyclique pour l'économie française, Notes d'Études et de Recherche, NER - E # 187, Banque de France, Novembre 2007.

Bourne C., (2008), Caribbean economic recessions in historical perspective, Nineteenth Annual Commercial Banks Conference, Eastern Caribbean Central Bank, St Kitts And Nevis, November 5-7, 2008

Bry, G. and Boschan, C. (1971), *Cyclical analysis of Time Series: Selected Procedures and Computer Programs*, New York, NBER.

Cashin, P. (2004), "Caribbean Business Cycles", IMF Working Paper, No. 136.

Craigwell R., Maurin A. (2001), "Production and Unemployment Cycles in the Caribbean: The Case of Barbados and Trinidad and Tobago", Central Bank of Barbados, Working papers.

Craigwell R., Maurin A. (2007a), Une analyse comparative des cycles conjoncturels de la Barbade et des États-Unis", Revue d'Economie Régionale & Urbaine, No 1, 2007, pp. 59-78.

Craigwell R., Maurin A. (2007b), "A Sectoral Analysis of Barbados' GDP Business Cycle", Journal of Eastern Caribbean Studies, Vol. 32, No 1, March 2007, pp.21-51.

Christiano L. J., Fitzgerald T. J. (1999), "The band pass filter", NBER, Working paper 7257, juillet 1999.

Christiano L. J., Fitzgerald T. J. (2003) « The Band Pass Filter », *International Economic Review*, 44, p. 435-465.

Fayolle J., Micolet P-E., (1997), Cycles internationaux : éléments pour une problématique appliquée, *Revue de l'OFCE* N° 62 / Juillet 1997, pp. 109-150.

Harding D., Pagan A. (2001), Extracting, analysing and using cyclical information, mimeo, Melbourne Institute of Applied Economics and Social research.

Harding D., Pagan A. (2002), Dissecting the cycle: a methodological investigation, *Journal of Monetary Economics*, Vol. 49, p. 365-381.

Harding D., Pagan A. (2002b), A comparison of two business cycle dating methods, *Journal of Economic Dynamics & Control*, Vol. 27, p. 1681-1690.

Harding D., Pagan A. (2004), A suggested framework for classifying the modes of cycle research, CAMA Working Paper Series, The Australian National University.

Harding, D. (2004), Non-parametric turning point detection, dating rules and the construction of the Euro-zone chronology, in *Monographs of Official Statistics : Statistical Methods and Business Cycle Analysis of the Euro zone*, G.L. Mazzi and G. Savio (eds.), Eurostat, pp. 122-146.

Harvey, A. C. (1989), *Forecasting, Structural Time Series Models and the Kalman Filter*, Cambridge University Press.

Kunhong K. Buckle R.A., Hall V.B., (1995), "Dating New Zealand business cycles", *New Zealand Economic Papers*, 29, 143-171.

Lewis D. (1997), A quarterly real GDP series for Barbados, 1974-1995 : a sectoral approach, Central Bank of Barbados, Economic Review, Vol. XXIV, No 1, June 1997.

Liu P., Romeu R., (2011), A dynamic factor model of quarterly real gross domestic product in the Caribbean: the case of Cuba and the Bahamas, International Monetary Fund.

Mönch E., Uhlig, H., (2005), Towards a Monthly Business Cycle Chronology for the Euro Area, SFB 649 Discussion Paper 2005-023, Humboldt University Berlin.

Murray A.D., (2007), Modelling the Jamaican Business Cycle : A Structural Vector Autoregressive Approach, Working Paper, Research Services Department, Bank of Jamaica.

Rand J., Tarp F., 2002, « Business Cycles in Developing Countries : Are They Different? », *World Development*, Vol. 30, No 12, pp. 2071-2088.

**Thomas and Serju (2009)**

Venter J.C., (2005), Reference turning points in the South African business cycle: Recent developments , *Quarterly Bulletin* September 2005, p. 61-70, South African Reserve Bank.

Watson, M.W. (1994), "Business Cycle Durations and Postwar Stabilization of the U.S. Economy," *American Economic Review*, 84, 24-46.

Whyte S., (2008), *An Analysis of the Jamaican Business Cycle*, Working Paper 2008/08, Bank of Jamaica.

Zarnowitz, V., Ozyldirim, A. (2006), Time series decomposition and measurement of business cycles, trends and growth cycles, *Journal of Monetary Economics*, 53, 1717-1739.